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PRELIMINARY REPORT
OF THE ENGINEER,
ON THE
SURVEY OF THE VARIOUS ROUTES,
FOR THE
PROPOSED SHIP CANAL,
TO CONNECT THE WATERS OF
LAKES HURON & ONTARIO
AT TORONTO,
TO THE
PRESIDENT OF THE BOARD OF TRADE.

JANUARY 22, 1857.

TORONTO:
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1857.

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B. Robertson

BOARD OF TRADE ROOMS, TORONTO EXCHANGE.

At a meeting of the Council of the Board of Trade, held at their Rooms, Exchange Building, 28th January, 1857, the Report of KIVAS TULLY, Esq., Civil Engineer, in reference to the Ship Canal between Toronto and Lake Huron was read, ordered to be printed and copies sent to the Government, and to each Municipality interested in the work, with a request for further subscription to enable the Committee to complete the survey for this important undertaking.

Extract from the minutes of Council, Board of Trade.

CHARLES ROBERTSON,

Secretary.

Toronto, 29th January, 1857.

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TORONTO AND GEORGIAN BAY SHIP CANAL.

TORONTO, January 22, 1857.

SIR,—In accordance with your directions, I herewith furnish a statement of the field operations, and other important data, connected with the Preliminary Survey, of the various routes for the proposed Ship Canal, to connect the waters of Lakes Huron and Ontario.

The project is by no means a novel one, having occupied the attention of the public for some years past; it did not, however, assume a practical shape until 1846, when I explored the proposed route through the "Ridges," in the Township of King, in company with Dr. Rees. I considered further exploration inadvisable at that time, as the advantages would not have been commensurate with the cost of the undertaking.

The cities of the "Great West" were then in their infancy, and no person could have prophesied so prosperous a future, as has since been realized.

From the anxiety expressed for some information on the subject, by the public in the United States, as well as in Canada, a Committee was formed in Toronto, and at their request, I made a second exploration of the "Ridges," in 1851, and ran a line of levels between the headwaters of the Humber and the Holland Rivers. The result was by no means satisfactory, owing principally to the difficulty of exploring a country at that time even only partially cleared; as from recent examination, a much more favourable route has been discovered within a short distance of the one originally explored.

The last examination was commenced on the 3rd of September, 1855, at the instance of the Board of Trade, in order to collect some definite information for the Convention of Delegates from Chicago, Milwaukie, Oswego, Barrie, Orillia and Toronto, on the

13th of September following. The Report of the proceedings of the Convention have been already published, and do not require further notice than to remark, that, notwithstanding the reported Engineering difficulties of the proposed route, it was Resolved, "That a thorough Survey, with estimates, of the country between Toronto and Lake Simcoe, and between Lake Simcoe and Lake Huron, with the view to the construction of a Ship Canal, should be immediately proceeded with, and that the various Towns and Counties interested in the work, be called upon to subscribe sufficient funds for the expense of the Survey."

A Committee was appointed to carry out the objects contemplated by the above resolution. On the 14th of September, the Committee directed me to take the necessary steps to complete the Survey, and engaged the services of Col. R. B. Mason, Chief Engineer of the Illinois Central Railroad, United States, as Consulting Engineer.

From the 3rd of September, until the 30th of October, a party of eight were constantly at work surveying and levelling the line between Toronto and Lake Simcoe, a distance of about forty miles; on the latter date, the Survey of the line between Lakes Simcoe and Huron, a distance of thirty miles, was commenced at Barrie by a party of fourteen, and continued at work until the 10th of December following, when they returned. While this portion of the route was under survey, another party of four were running a trial line of levels, by the west branch of the Humber, to the Nottawasaga River, a distance of forty-five miles, in which they were engaged three weeks.

A line of levels was also run from the River Don to the River Humber, a distance of about ten miles.

The above comprised the field operations for 1855, which included:—

Surveying and levelling.....	70 miles.
Leveling trial lines.....	55 "
Total.....	125 miles.

The trial lines of Levels were not originally contemplated, but were considered of so great importance as to be indispensable to the compilation of a complete Report, and as such, were sanctioned by the Consulting Engineer.

On the 16th of November, 1855, Col. Mason, the Consulting Engineer, arrived in Toronto, and on the 17th he commenced his examination of the route. I accompanied him to the various points which required particular attention, and we returned on the 23rd of November, when a verbal Report was made to the Committee, which you remember was highly favorable as regards the practicability of the undertaking.

The expenses at this period having exceeded the subscription by double the amount, I did not feel justified in proceeding with the Survey—particularly as the County Council of Simcoe objected to the payment of the remaining portion of their subscription, namely £50—unless a Survey between Lakes Couchiching and Huron, at the eastern portion of the County was undertaken. The justice of the objection was admitted by the Committee, and on the 4th of February following, a surveying party started from Toronto, but being detained at Orillia four days for want of snowshoes, operations were not commenced until the 11th, when a party of seventeen were formed. Three packmen being required in addition to the usual surveying party, as all the provisions, camp utensils, &c., had to be carried over the whole route, a distance of fourteen miles, there being no other means of communication. This party did not return until the 21st of March, 1856, having also completed a portion of the survey of the Nottawasaga River and Bay, which was left unfinished last season, and which consisted of about ten miles of swamp, inaccessible except during the winter, when the surface of the water was frozen.

I have thus detailed the field operations of the several routes, which have extended over a distance of 150 miles, at a cost of about £8 a mile, for the purpose of satisfying those who have taken an interest in the undertaking, that the work has been performed in as economical a manner as possible, consistent with the demands of the project.

During the whole of the above period I was constantly engaged either in exploring the various routes, or in providing for the several parties employed on the Survey; and I take this opportunity of stating that I have every reason to be satisfied with my assistants, who displayed much zeal and patience, under many privations and hardships, during the most inclement portion of the Autumn and Winter, namely, between September and April, nearly seven months.

I would also state that the Maps and Profiles, as far as the Survey has progressed, have been completed, and have been submitted to the Committee for inspection.

The unfinished portion of the route comprises about twenty miles to be surveyed, and about five miles of a trial line of levels to be connected.

It must be evident, that, until the Survey is completed, I will not be in a position to make a Report or Estimate, and without ample information it would be impossible for Col. Mason to complete his Report, as to the feasibility of the undertaking.

By reference to the memorial of the Board of Trade to the Honourable the Executive Council, for aid to complete the Survey, it will be observed, that £700 is due to me, and £300 is still required, making in all £1000, necessary to liquidate the whole liabilities, without which amount the Report cannot be made.

You are aware that I have encountered much pecuniary inconvenience already, to accomplish what has been done, and am willing to make all reasonable allowance for the difficulties incident to such projects; but it cannot be expected, that I could, with justice to myself, expend any further amount, until the guarantee of repayment was ensured to me; when this is done, I am prepared to take the necessary steps to complete the Survey, and furnish the Report.

Doubts having been expressed by several parties, professional and otherwise, as to the practicability of the project, I would take this opportunity of mentioning a few facts, and give a few practical instances from works already executed, which, I hope will convince

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the most sceptical, that the Engineering difficulties are not insurmountable; the feasibility can only be determined by a comparison of the estimated cost, with the direct and indirect advantages of the undertaking, which, from the want of data, cannot be discussed at present.

The greatest depths of cutting on the Welland Canal, between Port Robinson and Allanburg, is fifty-six feet, and including the spoil bank, sixty-six feet, according to official authority. The average cutting for one mile and a half in length is about thirty-four feet, and this was principally accomplished by manual labour, and under many difficulties, owing to the nature of the material. Even this excavation was at one time considered impracticable, and it was proposed to construct a Tunnel for about one mile and a half in length, as the only means of completing the communication, and the excavation for the Tunnel was actually commenced, the excavation is still to be seen on the banks of the Chippawa creek near Port Robinson.

I am informed that the depth of the excavation on the Chesapeake and Delaware Canal, in the United States, amounts to ninety feet for some distance.

The greatest excavation accomplished in England, of which I have authentic information, amounted to one hundred and forty feet through a most unfavorable soil, and overcoming difficulties which cannot, on any reasonable grounds of probability, be encountered in excavating through the "Ridges" north of Toronto.

The deepest excavation with which I am acquainted, and which, probably, has ever been executed, is near Hamilton, where the Great Western Railway crosses the Desjardins Canal, it is one hundred and twenty feet from the Suspension Bridge to the bottom of the Canal, with a slope on either side of about one and a half to one. It may be urged that this excavation is only for a short distance, but it will not be denied that if possible for a short distance, it is equally practicable for almost any length, provided the material remains the same. This material is termed "Drift" which is composed of Sand, Gravel and Boulders, deposited when the land was

submerged below the surface of the Ocean, at a period long antecedent to the present time, according to the opinion of the eminent Geologist, Sir Charles Lyell, in his account of Canada, and the United States, published in 1845.

From a careful examination and enquiry, I have every reason to suppose that the material of which the "Ridges" are principally formed for a depth of two hundred feet, at the point where the proposed Canal will stop, is identical with the beaches at Hamilton, and I have also ascertained, as far as I can judge, by boring and observation, that Quicksand, which was the cause of so much expense and difficulty, at the deep cut on the Welland Canal, will not be encountered in the "Ridges" at the level at which the excavation would be made.

In a late number of the *London Times*, the route of the *Proposed Ship Canal from the Atlantic to the Pacific*, through the Isthmus of Panama, is thus described:—

"The whole length of the Canal would be thirty-five miles. The Harbours on both coasts are excellently adapted for the termini of a great ship canal. The Savannah river is navigable at the mouth of the Lara—this is the first stage; there remain six others. From the junction of the Lara, with the Savannah to the Chuquanaqua, the distance is twelve miles. The country presents no Engineering difficulties for Canal purposes. The third stage is from the Chuquanaqua to the confluence of the Rivers Sucubti and Asnati, a distance of nine miles; the country is of the same character as in the last stage. The fourth section is six miles in length from the confluence of the rivers above named to the little Indian village of Sucubti. There is no difficulty here. In the fifth stage, three miles long, the land gradually rises *from one hundred and eight to four hundred and twenty feet*. In the Sixth stage, also three miles long, the *real pinch occurs*, the ground rises into a peak eight hundred and twenty feet high. *Here a Tunnel would be required*. The seventh stage takes in a distance of but two miles from the Peak to the Atlantic seaboard, but here all is plain sailing, and level ground." "It seems yet a question if this mountain which en-

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cumbers the Sixth stage might not be turned; and in order to ascertain this point, further and more accurate surveys are required. Such is the subject of Mr. McDermott's communication, which we have abridged from his letter, and which we now leave to the consideration of our readers. We are no Engineers, but when we look at the enormous works which have been executed at the different points in the civilized countries of the world, we cannot but think the construction of a Tunnel, three miles in length, is scarcely a work from which the human race need turn back in dismay. It may well be, however, that even this difficulty may be avoided; what seems wanted at present is more accurate information."

In the above remarks it will be perceived that the only contemplated difficulty is in the "Sixth stage," "where the ground rises into a *peak eight hundred and twenty feet high*." The excavation of *four hundred and twenty feet* is not considered a *difficulty*, neither can it be looked upon as such in those days of "Steam Excavators" and other mechanical inventions, which facilitate and economize human labour. When the London *Times* treats the subject of excavating four hundred and twenty feet, with the climate of Panama to contend with, as an ordinary Engineering matter, the project of excavating half that depth will not again be pronounced impracticable after dispassionate consideration.

With these facts before me, I cannot come to any other conclusion than the following, that the Excavation of the Ridges is only a matter of cost, and it may possibly be now considered as an insuperable difficulty, but even this objection will not apply to the future, as the great advantage which this route possesses over any other, as a connecting link between the "Great West" and the "Atlantic," would justify the expenditure of a much larger sum than has ever been contemplated by the most enthusiastic supporter of the undertaking.

A Ship Canal with an ample supply of water, only eighty miles in length, *can* be constructed to connect the waters of Lakes Huron and Ontario. This I am enabled confidently to state from the information which I now possess. It will remain with the citizens of

Toronto to determine, whether it is desirable to secure the advantages which so important a line of communication would confer on this portion of the Province, and the profits which would accrue to the city, as the Terminus on Lake Ontario, of so vast an amount of Traffic, which, of necessity, must pass through the Canal.

The following extract from a letter of a Montreal correspondent, signed "Canada," published in the London *Times* of December 26th, will give some idea of the growth of the West, and the probable increase of traffic:—

"The States of Illinois, Michigan, Iowa, Indiana, and the territory of Minnesota, are ready to pour their products into the lap of Europe. The vastness of the commerce that is about to centre in Chicago and Milwaukie is not generally known, and cannot be fully appreciated without actual observation. The population of the former place has increased from 30,000 to 120,000 in five years. Last year the railways terminated there (yet only partially completed) brought into it more than 16,000,000 bushels of grain, and other provisions in like proportion, which were exported in 6,600 vessels, and this year it is anticipated that the quantity will exceed 20,000,000 bushels."

For a more detailed account of the past progress, and future prospects of the lake and cities of the West, I would refer you to the published statistics of Chicago, and the speech of William Bross, Esq., of the "Chicago Democratic Press," at the late Montreal Celebration.

It is no more than probable that the anticipation of future progress there depicted, will fall short of the realization.

The improvement of the country between Toronto and Lake Huron, and the supply of Water Power to the City, would be amongst the local advantages, and there is no one but will admit that those advantages would prove a source of untold wealth, and would be worth the expenditure of a large amount of capital to secure, whilst the opportunity is afforded.

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much into detail, which, in reality, will be the subject of after consideration; the advantages are so obvious that I cannot but state, if they are secured, there is nothing can prevent Toronto being the largest and most influential City in British North America.

The exertions which Hamilton and Montreal are now using, *by every means in their power*, to secure permanently even a portion of the through traffic between the Western States and Europe, is an indication of its value and importance. The Western Trade which established Buffalo, was secured years ago, through the sagacity of De Witt Clinton, the projector of the Erie Canal.

A reference to the map of the United States and Canada will satisfy the most fastidious citizen that the geographical position of Toronto is, in many respects, far superior to any City in the Province. If the present opportunity is neglected, those interested in the progress of the City, will have much cause for regret hereafter, when the gradually increasing and immense traffic of the "West" is diverted by more circuitous, hazardous, and expensive channels to the Atlantic seaboard.

I have the honour to remain

Your obedient servant,

KIVAS TULLY,
Civil Engineer.

THOMAS CLARKSON, Esq.,
*President of the Board of Trade,
Toronto.*